

(19) World Intellectual Property Organization
International Bureau



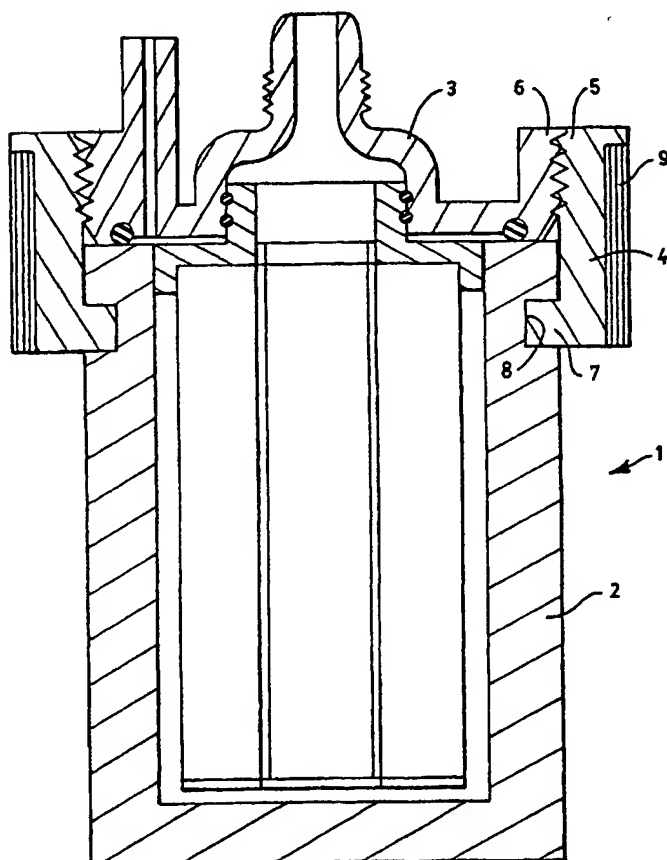
(43) International Publication Date
19 April 2001 (19.04.2001)

PCT

(10) International Publication Number
WO 01/26777 A1

- (51) International Patent Classification⁷: **B01D 35/30** (72) Inventor: STANKOWSKI, Ralph; 18 Boutwell Hill Road, Westford, MA 01886 (US).
- (21) International Application Number: PCT/US00/27363 (81) Designated States (*national*): CN, JP, KR, SG.
- (22) International Filing Date: 4 October 2000 (04.10.2000) (84) Designated States (*regional*): European patent (DE, FR, GB, IT, NL).
- (25) Filing Language: English
- (26) Publication Language: English
- (32) Priority Data: 09/418,978 14 October 1999 (14.10.1999) US
- (71) Applicant: MILLIPORE CORPORATION [US/US]; HUBBARD, John Dana, 80 Ashby Road, Bedford, MA 01730 (US).
- Published:
— With international search report.
— Before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments.
- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: FILTER HOUSING



(57) Abstract: A filter cartridge housing formed of a manifold and a bowl is disclosed. A threaded ring substantially fixed in a position relative to either the bowl or the manifold is used to positively drive the manifold and bowl together and apart as needed and to form a secure and liquid tight seal between the two components when they are together. In one example the threaded ring is held by a key in the keyway on the outer surface of the bowl. The threads of the ring mate with the threads on the manifold. As the ring is relatively fixed by the key/keyway to its position on the bowl, it moves the bowl relative to the manifold as the ring is rotated onto or off of the mating threads of the manifold. The key/keyway may be formed on the manifold instead. Alternatively, other retention devices such as a ridge, lip or snap ring may be used in lieu of the key/keyway design.

WO 01/26777 A1

BB

FILTER HOUSING

The present invention relates to a filter housing having a manifold and a bowl with a threaded ring there between to secure the bowl to the manifold. More particularly, it relates to a
5 filter bowl and manifold which has a threaded ring retained in a fixed position relative either to the bowl or manifold and which is used to drive the bowl and manifold together or apart.

BACKGROUND OF THE INVENTION

There are two basic types of filter housings used today for filter cartridges. The first and most recent is the disposable housing. Typically formed of plastic, it has a filter cartridge
10 sealed inside. Once it has been used the entire device, housing, filter and all are simply thrown away. The second and more common type is the disposable filter cartridge in a reusable housing.

In this type of device, the housing is formed of two portions, a manifold and a bowl. At least the manifold is typically connected to the fluid stream and generally supported or fixed in
15 place. A first filtration modular design locates all of the connections at the same end of the module. In this type of module, the feed and permeate ports are typically horizontally oriented at the top or "head" end of the module on opposite sides thereof. Due to their shape, these modules are referred to as having a T configuration. The T configuration facilitates connection of the head to the remaining portion of the filtration module comprising the bowl and the
20 filtration cartridge positioned within the bowl. When fluid only enters or exits through the manifold and correspondingly exits or enters through a separate opening formed in the bowl, the device is commonly referred to as an "in line" type housing (as fluid flows in line through one end of the device [either manifold or bowl] and out the other end of the device).

In either of these embodiments, the bowl is removably attached to the manifold via a
25 threaded ring that mates with threads on the manifold. The bowl and manifold are simply held together by the threaded ring. One or more filter cartridges are secured inside the bowl. To replace a filter cartridge, one simply removes unscrews the ring, pulls the bowl from the

component. Alternatively, other retention devices such as a ridge may be used in lieu of the key/keyway design.

5 It is an object of the present invention to provide a filter housing comprising a bowl and a manifold, a threaded ring retained in a fixed position relative either to the bowl or manifold and which is used to drive the bowl and manifold together or apart.

10 It is another object of the present invention to provide a filter housing comprising a manifold and a bowl, the manifold having a series of threads formed on its outer surface, the bowl having a ring with threads on its inner surface which mate with the threads of the manifold, the ring being secured to the bowl so as to maintain a relatively fixed position on the vertical axis of the ring.

15 It is a further object of the present invention to provide a filter housing comprising a manifold and a bowl, the bowl having a series of threads formed on its outer surface, the manifold having a ring with threads on its inner surface which mate with the threads of the bowl, the ring being secured to the manifold so as to maintain a relatively fixed position on the vertical axis of the manifold.

20 It is another object of the present invention to provide a filter housing comprising a bowl and a manifold, a threaded ring retained in a fixed position relative either to the bowl or manifold and which is used to drive the bowl and manifold together or apart wherein the ring is secured to the bowl via a keyway and a key formed on the inner surface of the ring and mounted within the keyway of the bowl.

25 It is a further object of the present invention to provide a filter housing comprising a bowl and a manifold, a threaded ring retained in a fixed position relative either to the bowl or manifold and which is used to drive the bowl and manifold together or apart wherein the ring is secured to the manifold via a keyway and a key formed on the inner surface of the ring and mounted within the keyway of the manifold.

It is an additional object of the present invention to provide a filter housing comprising a bowl and a manifold, a threaded ring retained in a fixed position relative either to the bowl or manifold and which is used to drive the bowl and manifold together or apart wherein the ring is

relative to the first component in this case the bowl 2, i.e. it cannot move any substantial distance along the length of the bowl 2. When its threads 5 are mated to the corresponding threads 6 on the second component, in this case the manifold, 3 and the threads 5,6 are drawn together, the ring 4 carries or drives the first component or bowl 2 into affirmative contact with the second component or manifold 3. Conversely, when the ring 4 is rotated so as to drive the threads 5,6 apart, the first component or bowl 2 is positively carried or driven away from the second component or manifold 3.

The device used to fix the position of the ring 4 to one of the two components can be a variety of devices. As shown in Figure 1, the ring 4 is fixed to the first component 2, i.e. the bowl in this embodiment, using a key 7 formed on the ring 4 which key 7 mates and is held within a keyway 8 formed in the bowl 2. The ring 4 is shown with a knurled feature 9 on a portion of its outer side surface. The use of knurling or other such devices for providing an easy, slip-free surface to the ring is well known and may be used in this invention. Additionally, the use of lugs or tapered surfaces on the outer surface of the ring may be used to allow one to attach a wrench or other device for moving the ring relative to the other threaded component. While it is contemplated in the preferred embodiments of this present invention that no wrench or other device is necessary to move the ring, it is still within the scope of the present invention.

While the ring 4 is shown as being fixed to the bowl 2 in this embodiment, it may as easily be fixed to the manifold 3 as in Figure 2 (the same numbers as in Figure 1 apply where relevant in figure 2) . Here the ring 4 is attached to the manifold 3 rather than the bowl 2 of Figure 1. The keyway 8 is formed in the manifold surface and the key 7 of the ring 4 is trapped within it. The threads 5 of the ring 4 mate with the threads 6 of the manifold 3 to drive the manifold 3 and bowl 2 together and apart.

Alternatively, the ring may be retained to either component by the use of a different type of retention device. In Figure 3 is shown an embodiment in which one or more ridges 10, in this case one ramped ridge is formed on the surface 11 of the component to which it is desired to attach the ring 12. In this instance, the ring 12 is attached and substantially fixed to the manifold 13 of the housing 14. The other component of the housing is the bowl 11. The ring 12 in this instance is made of plastic and is force fit or snap fit over the ridge 10 and thereafter retained in a substantially fixed position relative to the length of the bowl 11. In this instance,

a circular ring positioned along a portion of the outer surface of the side wall of the bowl 42. The bowl 42 also has a lip 44 which extends outward from the upper portion of the outside surface of the side wall of the bowl 42. The threads 45 of the ring 41 mate with the threads 46 of the manifold 47.

5 As can be seen, there is substantial room between the lip 44 and the ridge 43 along the length of the side wall of the bowl 42. Yet, this embodiment still shows the ring 41 being in a substantially fixed position relative to the bowl 42. By the term "substantially fixed", it is meant that the ring is retained to one component of the housing in such a manner that its travel along the length of the component is less than 50% of that length. Preferably, the amount of
10 travel allowed to the ring relative to the length of the component is less than 25% of the component length.

In other terms, the length of travel of the ring relative to the length of the component should be such that at least for a portion of the rotation of the threads between the ring and the second component, there is a driving force caused by the threads of the ring to move the
15 components affirmatively. Preferably, the length of travel is limited such that the threads of the ring will begin to rotate against those of the other component for some set (as desired by the manufacturer) distance before the ring threads are in a position to positively drive the two components together or apart. In this way, one is staggering the load placed upon the ring making its use easier, quicker and simpler.

20 Alternatively, one can use other devices should as band clamps, lugs, etc to retain the ring in its desired substantially fixed position relative to the component to which it is mounted. The device used to retain the ring in a substantially fixed position relative to the component to which it is attached is not critical so long as it allows the two components to adequately move relative to each other to form a liquid tight seal and to allow the ring to retained in a manner so
25 that it affirmatively drives the two components at least a portion of the way together and apart as desired.

Preferably the housing of the present invention is used in conjunction with a unitary filter/bowl assembly such as is described in the co-pending US Application, 60/103,646 filed October 09,1998 the teachings of which are incorporated herein in their entireties. In this

in particular, perfluorinated thermoplastic resins; PVC; nylons; polyamides; polysulphones; modified polysulphones such as polyethersulphones, polyarylsulphones and polyphenylsulphones; polyimides; polycarbonates; PET and the like.

5 Lastly, in all of these embodiments the bowl and manifold may be made of a plastic, preferably a thermoplastic including polyolefins such as polyethylenes including ultrahigh molecular weight polyethylenes, polypropylenes; copolymers or terpolymers of polyolefins; nylons; PTFE resin, PFA, PVDF, ECTFE, and other fluorinated resins, particularly perfluorinated thermoplastic resins; polycarbonates; metallocene derived polymers, polysulphones; modified polysulphones such as polyethersulphone, polyarylsulphones or
10 polyphenylsulphones; any glass or other reinforced plastic; or a metal such as stainless steel, aluminum, copper, bronze, brass, nickel, chromium or titanium or alloys or blends thereof.

9. The housing of claims 1, 2 or 3 wherein the ring drives the housing and manifold together and apart as the threads are rotated in an appropriate direction relative the threads of the component which has threads mounted upon it.
10. The housing of claims 1, 2 or 3 wherein the housing, ring and manifold are formed of a material selected from the group consisting of metal and plastic.
11. The housing of claims 1, 2 or 3 wherein the housing, ring and manifold are formed of a metal selected from the group consisting of stainless steel aluminum, copper, bronze, brass, chromium, titanium, alloys and blends thereof.
12. The housing of claims 1, 2 or 3 wherein the housing, ring and manifold are formed of a plastic selected from the group consisting of PTFE resin, PFA, PVDF, ECTFE, fluorinated polymers and copolymers, perfluorinated thermoplastic polymers and copolymers, polyolefin homopolymers, copolymers and terpolymers, ultrahigh molecular weight polyethylene, metallocene derived polymers, PVC, nylons, polysulphones, polyethersulphones, polyarylsulphones, polyphenylsulphones, polycarbonates, polyamides, polyimides and blends thereof.

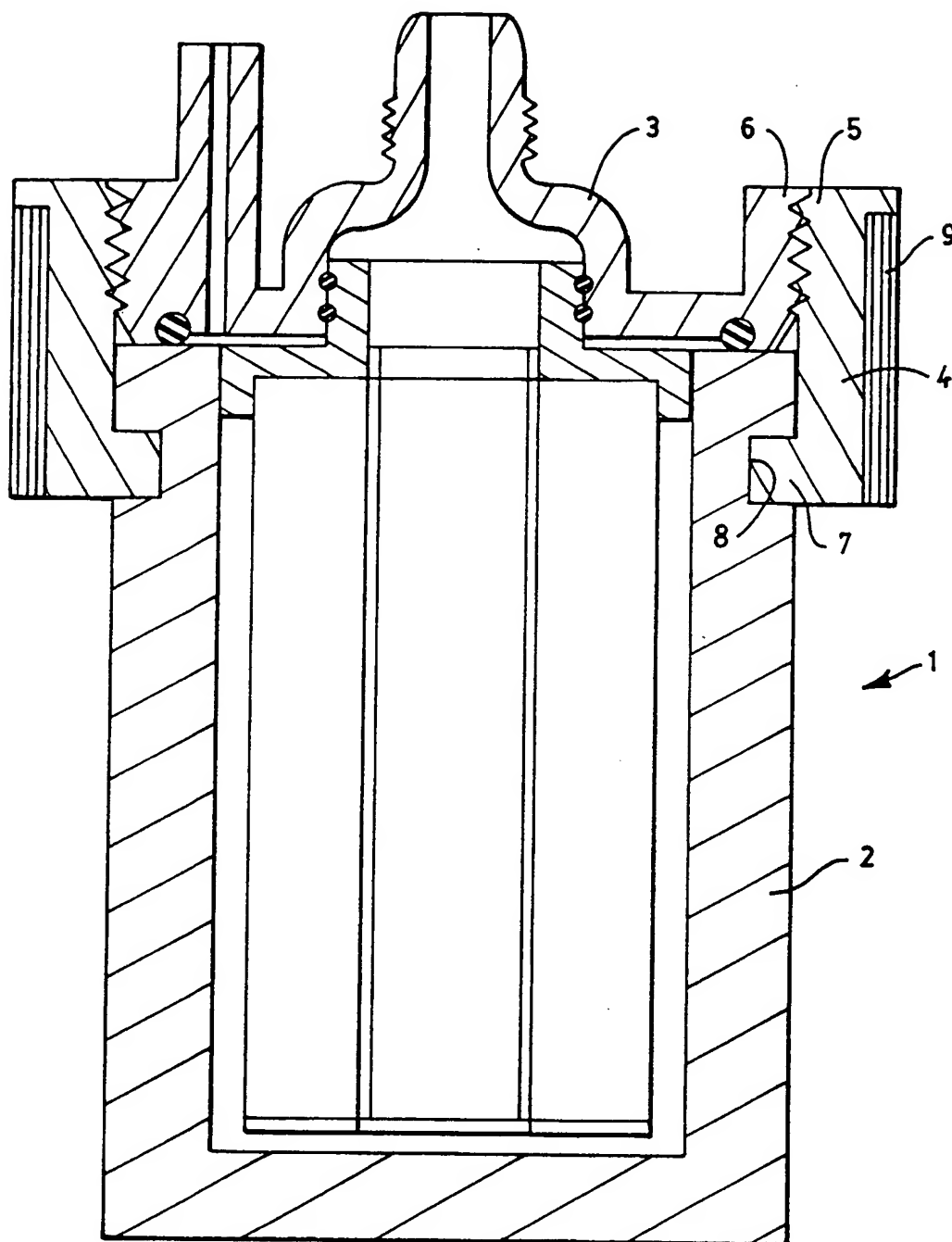


FIG. 1

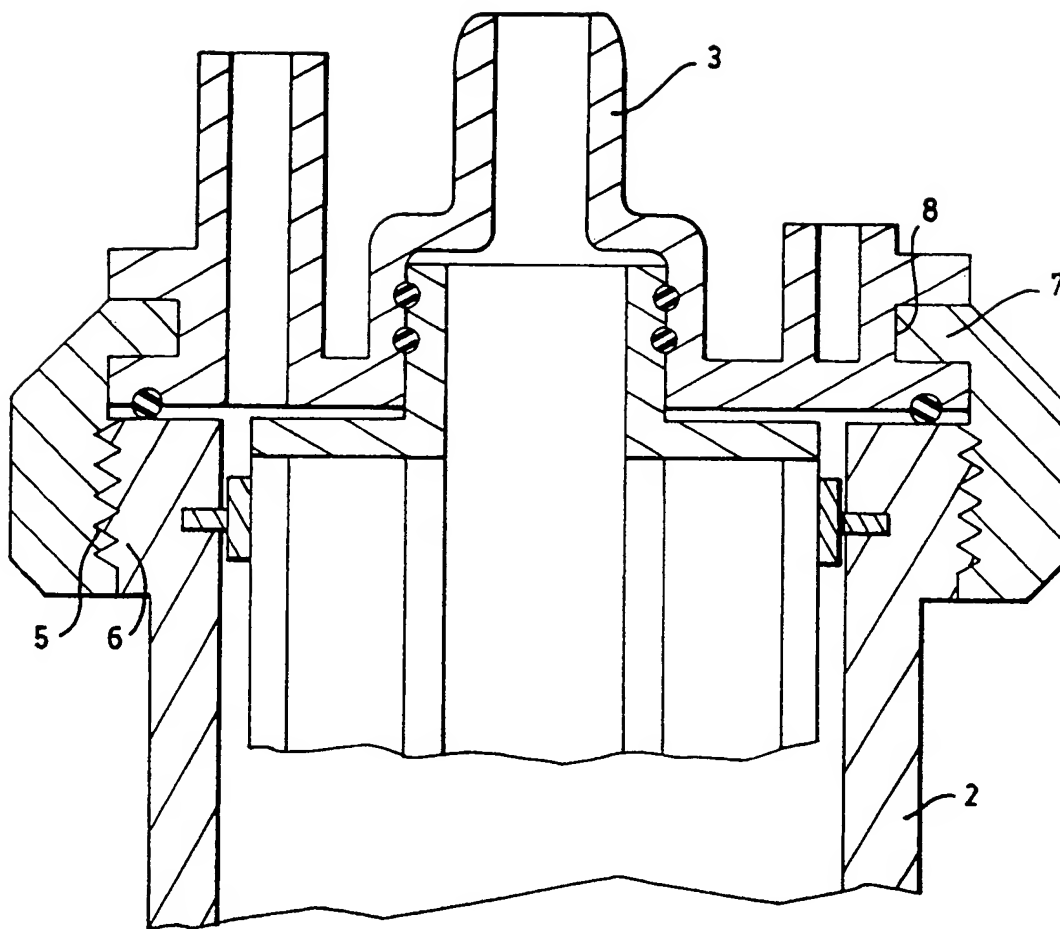


FIG. 2

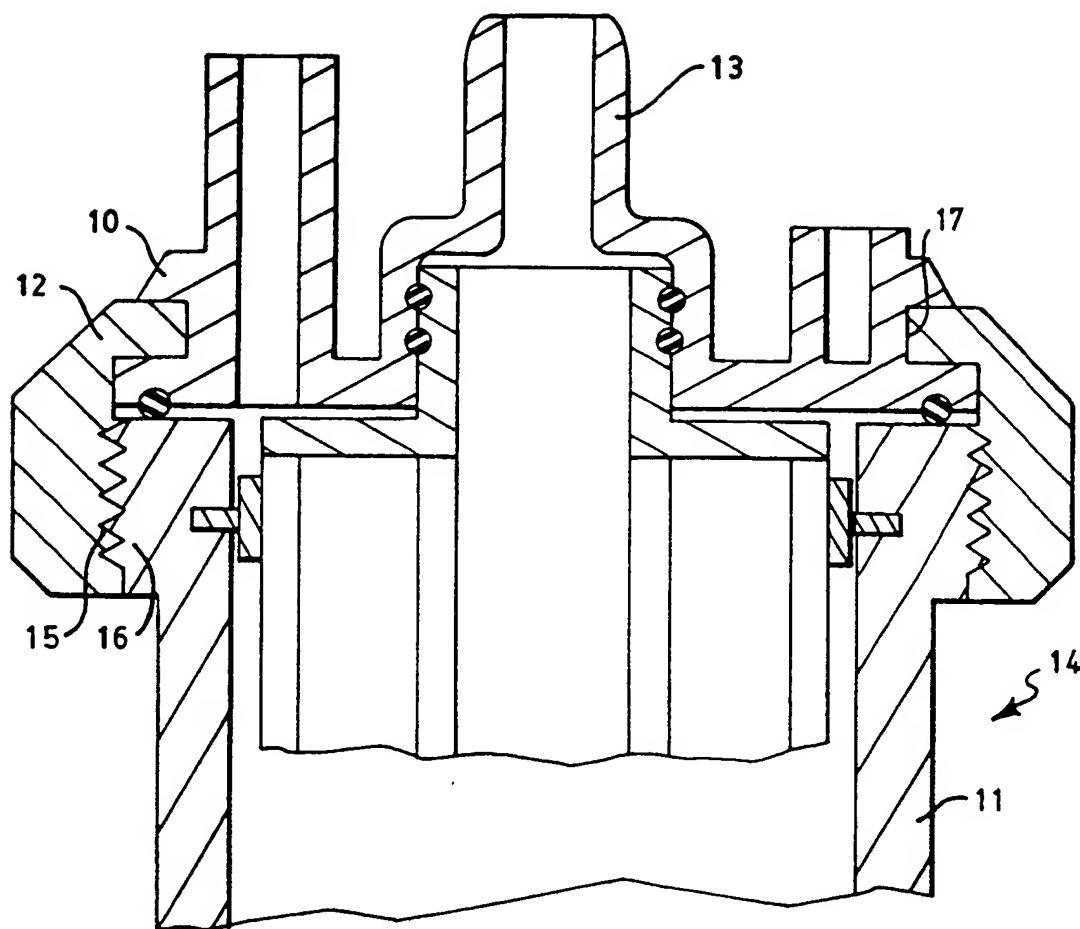


FIG. 3

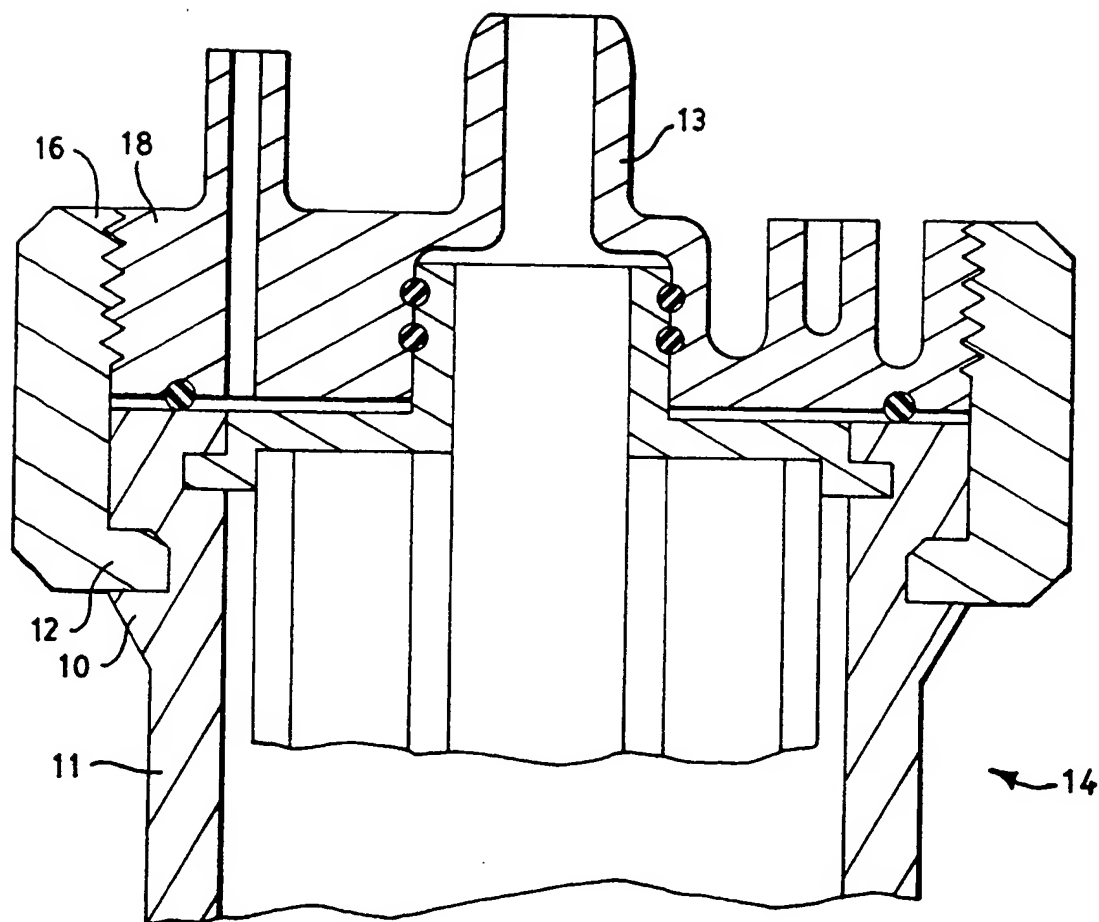


FIG. 4

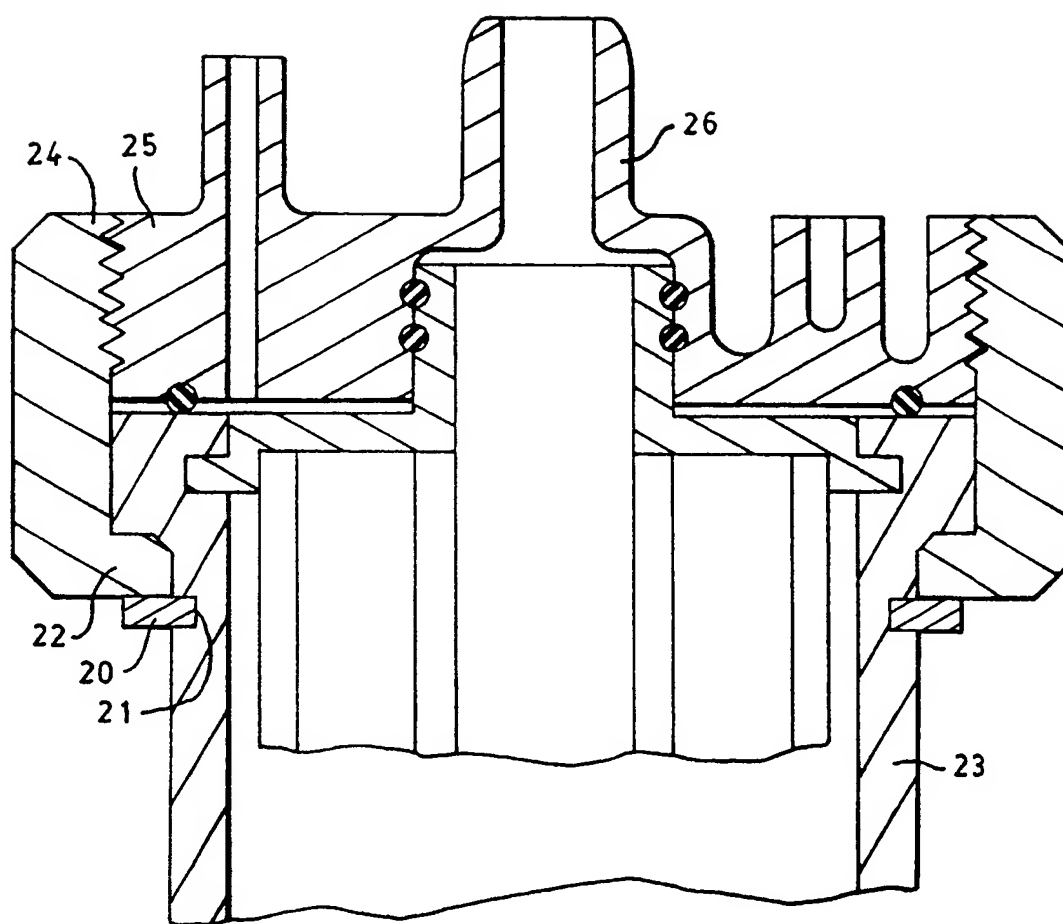


FIG. 5

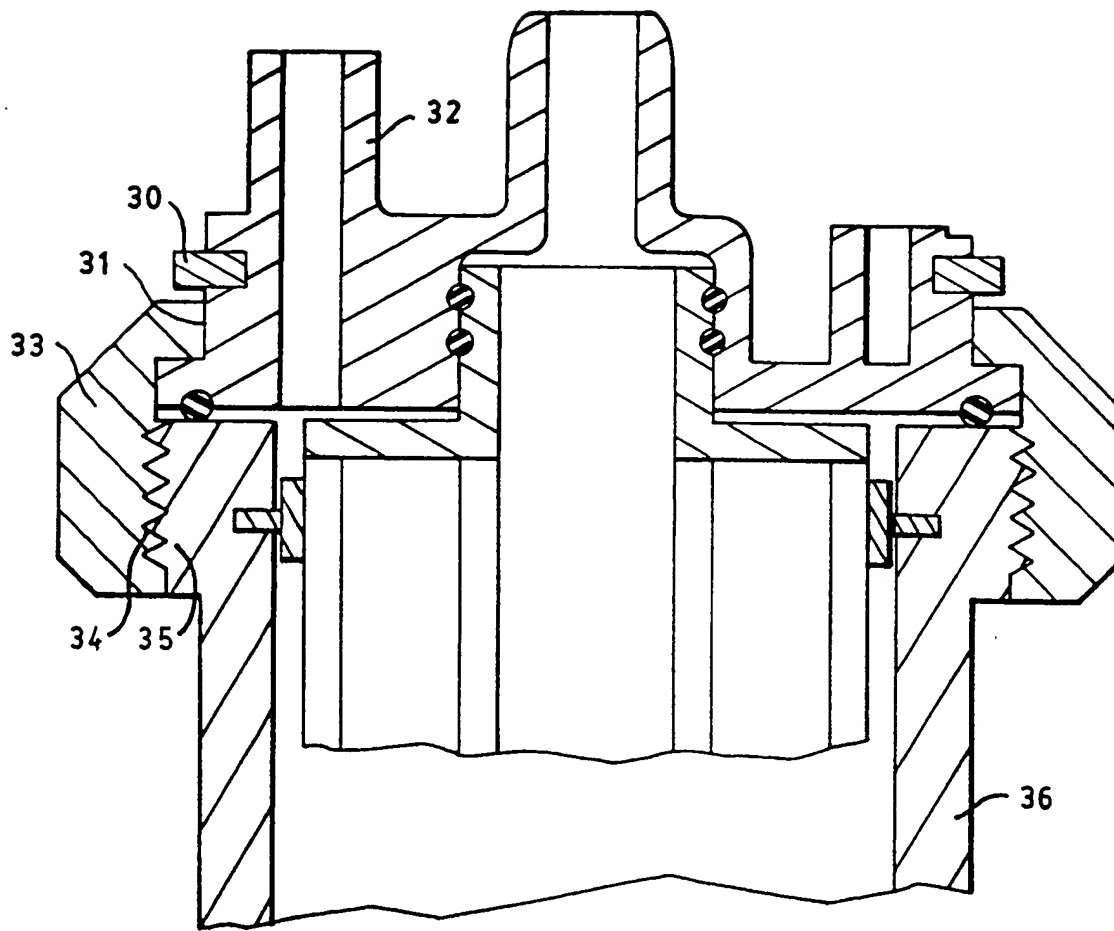


FIG. 6

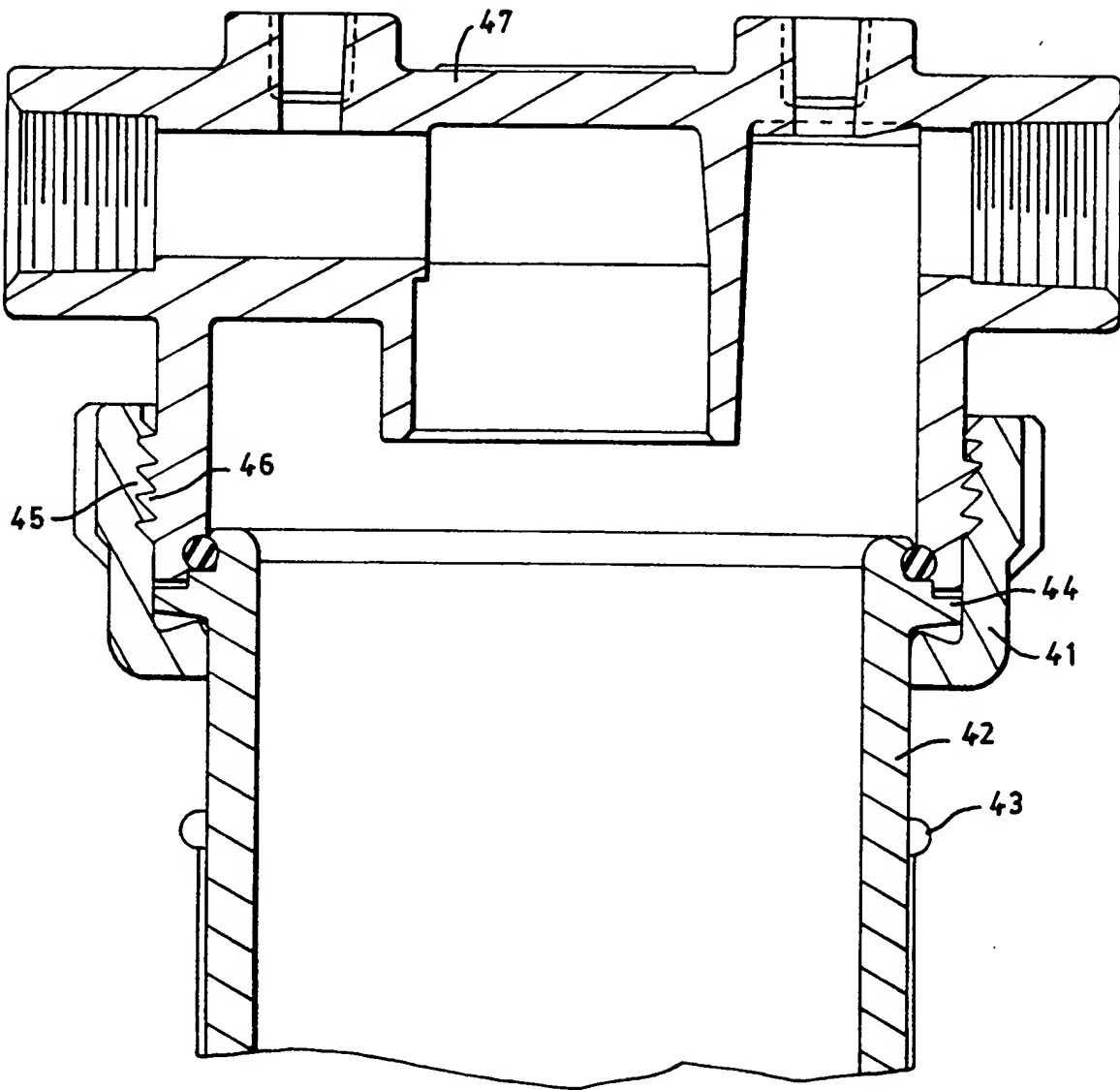


FIG. 7

INTERNATIONAL SEARCH REPORT

In. tional Application No
PC 00/27363

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B01D35/30

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B01D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 133 858 A (WALZ DAVID K ET AL) 28 July 1992 (1992-07-28) abstract column 3, line 2 - line 25 claims; figures 1-3	1,3,7,9, 10,12
A	---	2
A	US 4 316 801 A (COOPER ROYDON B) 23 February 1982 (1982-02-23) the whole document	1-3
A	---	
A	US 4 172 798 A (KRONSEIN DIRK G) 30 October 1979 (1979-10-30) the whole document	1-3
A	---	
A	EP 0 657 201 A (STANADYNE AUTOMOTIVE CORP) 14 June 1995 (1995-06-14) the whole document	1-3,11, 12

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- * & * document member of the same patent family

Date of the actual completion of the international search

21 February 2001

Date of mailing of the international search report

02/03/2001

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Hilt, D